

OCCURRENCE OF AN ANTHOCYANIN-LACKING
FORM OF ELEPHANT'S-HEAD LOUSEWORT,
PEDICULARIS GROENLANDICA (SCROPHULARIACEAE)

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ABSTRACT

A new, pale form of *Pedicularis groenlandica* Retz. (elephant's-head lousewort) from Churchill, Manitoba is described as forma *chlorina* Staniforth, Maycock & Svoboda. Individuals of this form lack the normal reddish anthocyanin pigment found throughout foliage, stems and flowers of the type variety. Six mature plants possessed old infructescences that predated their discovery by three years. These structures, together with the observation of numerous seedlings and presence of developing seeds in capsules, suggested that the colony is well established. Information regarding a new far-northern record of the white flowered form (f. *alba* Cody) of *P. lanata* Cham. & Sch. is provided.

Key Words: *Pedicularis groenlandica*, forma *chlorina*, Manitoba

INTRODUCTION

The herbaceous genus *Pedicularis* (louseworts), family Scrophulariaceae, is represented in Canada by twenty-two species (Scoggan, 1978), many of which have brightly colored flowers, strong fragrances, and intricate flower forms. In many species, local populations have been described which differ from the type species with respect to flower color, corolla shape and degree of pubescence (see Scoggan, 1978). In July 1985, the authors discovered a population of pale green, white-flowered individuals of the normally purple-red *P. groenlandica* Retz. (elephant's-head lousewort) near Churchill, Manitoba. This form has not been previously described.

DESCRIPTION OF FORMA *CHLORINA*

The purplish anthocyanin pigments in the leaves, stems, sepals and petals of normal plants were absent in this form, so that the plants appeared greenish-yellow and the flowers white. A diagnosis of this new form follows:

***Pedicularis groenlandica* Retz. f. *chlorina* forma nova**

A typo differt corollis albis non pupureis, et caulibus foliisque chlorinis non pupureis.

Ramets of forma *chlorina* were collected and preserved as the form holotype in the herbarium of Erindale College, University of Toronto (TRTE). Lepage (1951) described two new forms of *Pedicularis groenlandica* from Fort George in northern Quebec: forma *pallida* and forma *gracilis*. The former has white flowers (drying to yellowish) with purplish bases, and the latter was a slender plant with normal, colored flowers and vegetative parts. Abrams (1951) lists subspecies *surrecta* (Benth.) Piper which has pale flowers and long beaks on the galeas and capsules. None of these forms is the same as that described here.

Pedicularis groenlandica forma *chlorina* was identical to the pigmented plants, apart from coloration and vigor (Figure 1). The population of forma *chlorina* was at the same stage of maturity; i.e., flowering was three-fourths completed by July 29, 1985. Plant height (mean 30.4 cm), numbers of reproductive spikes per plant (mean 3.2), numbers of blossoms and/or capsules per spike (mean 30.0) as measured for forma *chlorina* appeared comparable to that of the normal form, for which data are unfortunately not available. An opened capsule contained numerous white, ripening seeds, which appeared to be as well-developed as those from adjacent, normally-pigmented plants. They were obviously viable since there was a dense carpet of seedlings under the plants. The stems of the green plants appeared more robust, as if the energy required to produce the red pigment was shunted into some other function.

SITE AND HABITAT DESCRIPTION

A total of six reproductively mature plants of forma *chlorina* was found amongst 32 normally-pigmented plants along a 15 m section of a drainage ditch. Plants of *Pedicularis groenlandica* have clustered stems from stout caudices (Hultén, 1968); the absence of creeping rhizomes indicates that clumps and seedlings are distinct individuals and not merely asexually produced sprouts.

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Figure 1. A. Drainage ditch near Churchill, northern Manitoba, the site of *Pedicularis groenlandica* f. *chlorina*. Plants of this form are located to the right of the ranging pole. Spikes of the normal, purplish plants are found throughout the ditch. B. Purplish pigmented (normal) plants of *P. groenlandica* growing near Churchill, Manitoba. C. Flowering spikes of plants of f. *chlorina*.



Normally-pigmented plants were abundant over the remaining 0.75 km of the ditch but no additional individuals of forma *chlorina* were found. The ditch was located 0.6 km south of Akudlik and 5.0 km southeast of Churchill, Manitoba, running westward from Goose Creek Road to the Canadian National Railway line. The six plants were located within 60 cm of a small stream in the center of the ditch. Vascular plant cover was approximately 70%, and exposed substrate surfaces were covered by algal and bryophyte mats. Species in proximity to individuals of forma *chlorina* were: *Carex aquatilis* Wahl., *C. capillaris* L., *Triglochin maritimum* L., *T. palustre* L., *Juncus arcticus* Willd., *J. balticus* Willd., *J. triglumis* L., *Salix brachycarpa* Nutt., *S. calcicola* Fern. & Wieg., *Betula glandulosa* Michx., *Pinguicula vulgaris* L., *Pedicularis flammea* L., and *Aster borealis* (T. & G.) Provancher. Vegetation surrounding the ditch was subarctic forest dominated by *Picea glauca* (Moench) Voss, *Larix laricina* (Du Roi) Koch, *Salix* spp., *Vaccinium uliginosum* L., *Empetrum nigrum* L., and *Carex* spp.

ECOLOGY

Plants of this new form are striking for their combination of elaborate flower design, pale green foliage and brilliant white flowers. Albinism in corolla color is not infrequent in plants and is usually attributed to the mutation of a single gene, which results in the lack of pigment production (Strickberger, 1985). The ability of white mutants of brightly colored, entomophilous species (like *P. groenlandica*) to attract pollinators effectively is of interest because it would determine pollination success, seed production and consequently, survival of the mutant. The authors assume that pollination was successful in forma *chlorina* because its capsules contained almostripe seeds, and because of the abundance of nearby seedlings. Normally, the flowers would be pollinated by worker bumble-bees (*Bombus* spp.) which cause resonance in the blossoms by means of peculiar wing beats (Faegri and van der Pijl, 1971). Pollen is then released onto the bee. Unfortunately, we observed no bumble-bees or any other insects visiting flowers of either form during our studies. Selfing would seem improbable because the stamens and stigmas are physically separated by the corolla tube ("elephant's trunk"). However, a large ratio in favor of seedlings of forma *chlorina* suggested that selfing may have been more frequent than originally thought. Selfing would result

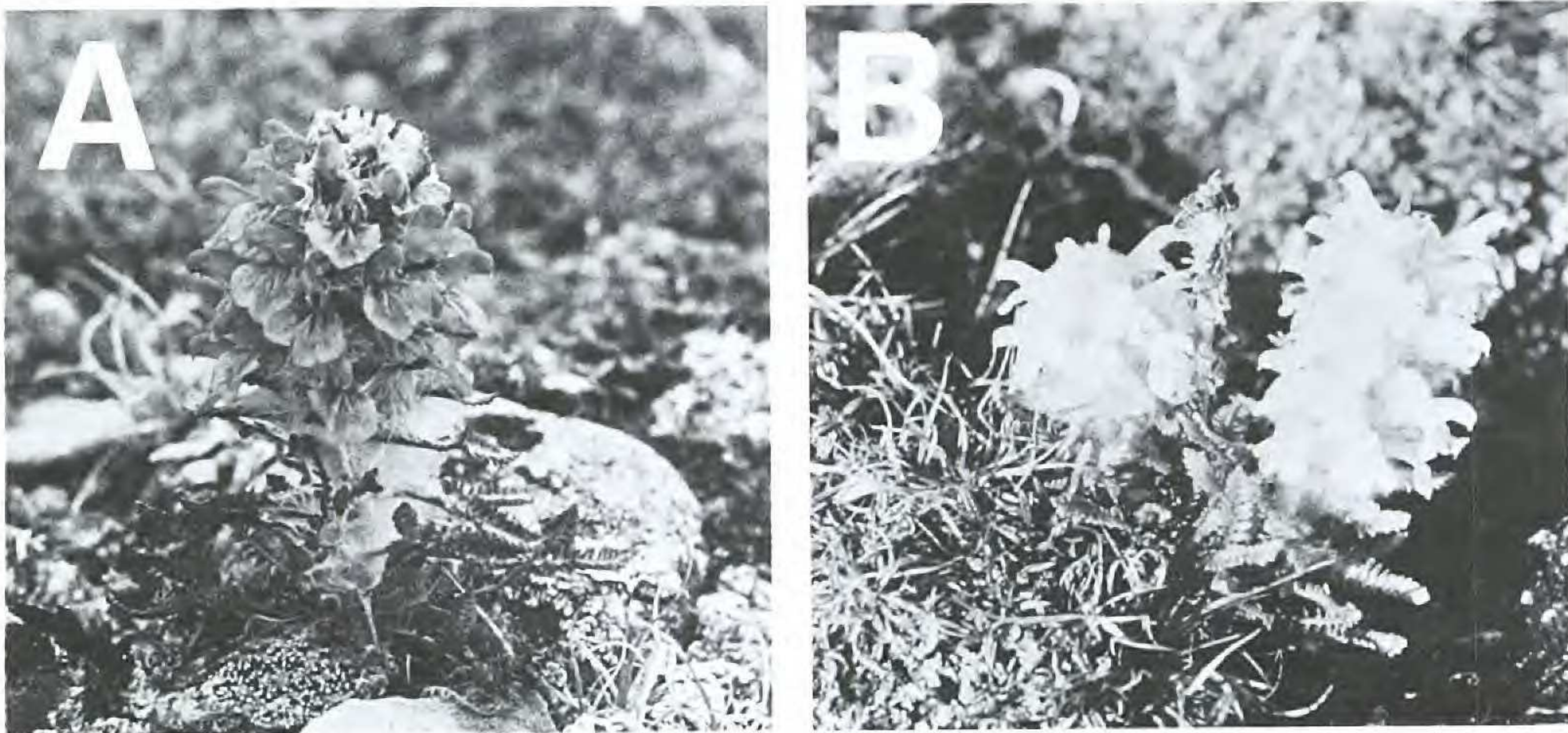


Figure 2. A. Purple-flowered (normal) plant of *Pedicularis lanata*, growing in the Truelove Lowlands, Devon Island, N.W.T. B. White-flowered f. *alba* found growing near the plant shown in 2A.

in an increase in homozygosity of recessive alleles (such as albinism), and this fact would account for the large number of seedlings of forma *chlorina* in the vicinity of their parent plants. The scarcity of normal-colored seedlings in proximity to many mature normal plants would support this contention.

The question arises as to whether the plants of forma *chlorina* are genetically normal plants reacting to a toxin (perhaps herbicides from the railway line). Such a toxin might block or induce the breakdown of anthocyanin. However, observations of intermixing by normal and pale plants, and that the plants of forma *chlorina* were found well away from sources of disturbance, do not support the suggestion that a toxin could be the causal factor. Growing seeds in the greenhouse and noting the color of the seedlings likely would be difficult due to probable hemi-parasitism in this species.

Three large plants possessed old flowering spikes from 1983 and 1984, hence the colony dates to at least 1982. The number of seedlings of forma *chlorina* outnumbered those of the pigmented form by 10:1, even though reproductively mature plants were less frequent (1.0:6.5). The reversal in ratios for mature plants may indicate that forma *chlorina* will become abundant relative to the typical form in future years, unless seedling mortality in this form is very high, due to other unfavorable factors. The visibility of this interesting population will make it a suitable subject for studies on population size and dispersal ecology.

A further observation on relationships of albino forms and dispersal ecology in this genus should be included. In July 1985, J.S. found an albino form of *Pedicularis lanata* Cham. & Sch. (woolly lousewort) in the Truelove Lowland, Devon Island, North West Territories, Canada. The single individual was a twin-stemmed plant, growing in a high arctic tundra community. Both stems were flowering but the season was too early for observations to be made on seed viability. The plant was not collected due to its rarity. The white coloration of the petals and pale green leaves and stems contrasted strongly with those of the common, purple-colored form. No pale-colored seedlings were observed around the plant (Figure 2). The specimen appears to fit the description of forma *alba* Cody, described from Southampton Island, N.W.T., Canada (65°N), by Cody (1951). The specimen observed on Devon Island (75°N) represents a site approximately 800 km north of the previous records.

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